Roads and Waterways Administration 1989

Developing the main road network in Finland

A basis for reassessment

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Introduction

The present main road network is extensive and unhomogenous from the traffic point of view. High standard improvement of the main roads is important for the development of Finland and for main road network traffic.

At the beginning of 1989 the Roads and Waterways Administration started the study concerning main road network development. In the first stage the aim of this study is to define the extent and quality of the main road network. This report, which includes two main road network alternatives, is meant for a discussion basis. As soon as the Roads and Waterways Administration gets the statement from various parties and has discussed the issue with the Ministeries, it will give the Ministry of Transport and Communications its proposal concerning the road connections and links, with which a high standard main road network will be developed in the long term.

The study has been carried out at the Roads and Waterways Administration with Suunnittelukolmio Oy as a consultant. The Technical Research Centre of Finland has carried out the study of the effects of traffic, driving costs and changes in injuries/fatal accidents in the two alternatives.

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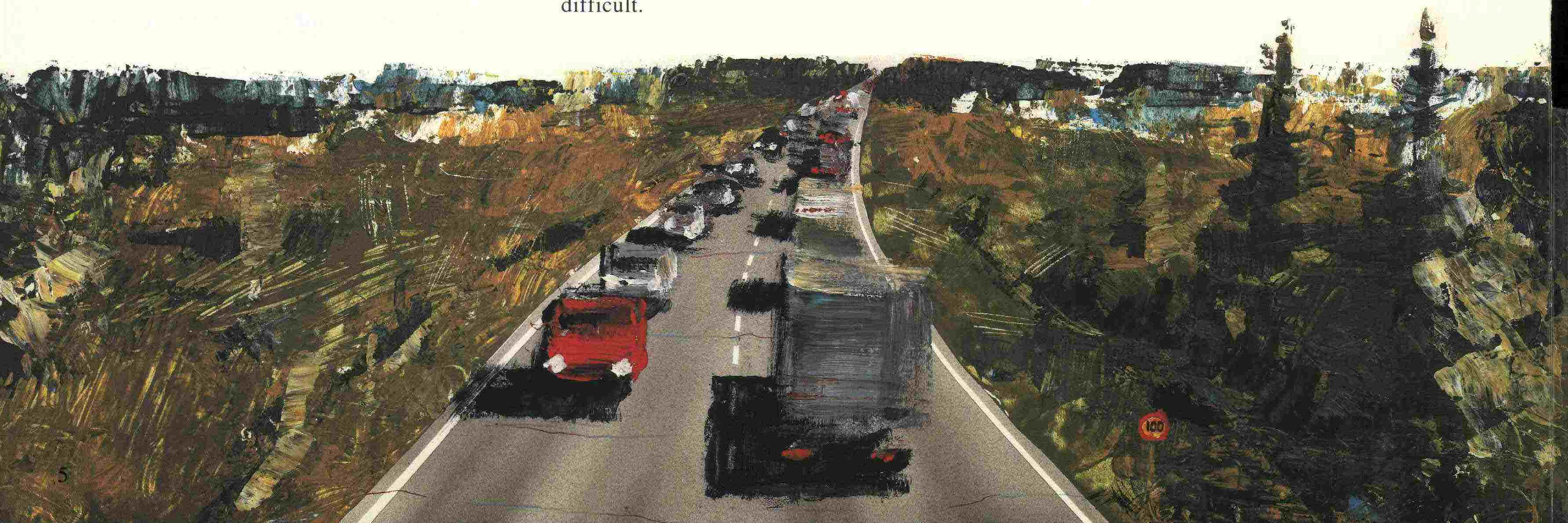
Problem

Traffic conditions on the most important main roads have been deteriorating quickly in the last few years. The share of roads with traffic-jams and queues has more than trebled during this decade. In many places the roads are badly damaged and worn. In addition to this the road surroundings are densely built. The number of accidents on the main roads has grown over 40 % during this decade.

The ones suffering most are transportation and long-distance traffic, which, again, affect our country´s economy and the whole society. In addition to weakening the international competitiveness of our industry the poor level of service of the main roads also makes the balanced development of the different parts of the country difficult.



Proposals for the development of the main road network

Government budget 1989: "In the next few years focus will be on the improvement of the condition and traffic conditions of the most important main roads. More attention will be paid to traffic problems in large cities. In order to achieve these goals the real increase in the 1989 road appropriation will be more than the growth in traffic and it will be used for the improvement of the traffic capacity and the safety of the main roads. It will also be used for projects with the same goals".

Government report to Parliament on traffic policy 12 April, 1988: "The aims for the road network and traffic conditions of the 1990´s require a road policy change from focusing on the lower class road network to focusing on the main roads. At the same time more attention will be paid to traffic safety and road maintenance.

The improvement in the traffic capacity of the main roads and the solving of traffic- and environmental problems in large cities require substantial road investments. This cannot be done with the present road appropriations without putting a stop to the improvement- and traffic safety measures of the rest of the entire road network".

The plan of the Ministry of Transport and Communications for 1990 - 1994: "The stress in the development of traffic routes will be on the main roads with the heaviest traffic, the main railroad lines and Helsinki airport. Development measures based on other than traffic or traffic safety reasons will be carried out only if they are especially important".

The regional statement of the Ministry of the Interior concerning the plans of the ministeries for 1990 - 1994: "In order to be able to carry out the plans made and at the same time also see to other investment needs besides the ones related to the development of the main road network, the most important projects ("special main roads") must be defined.

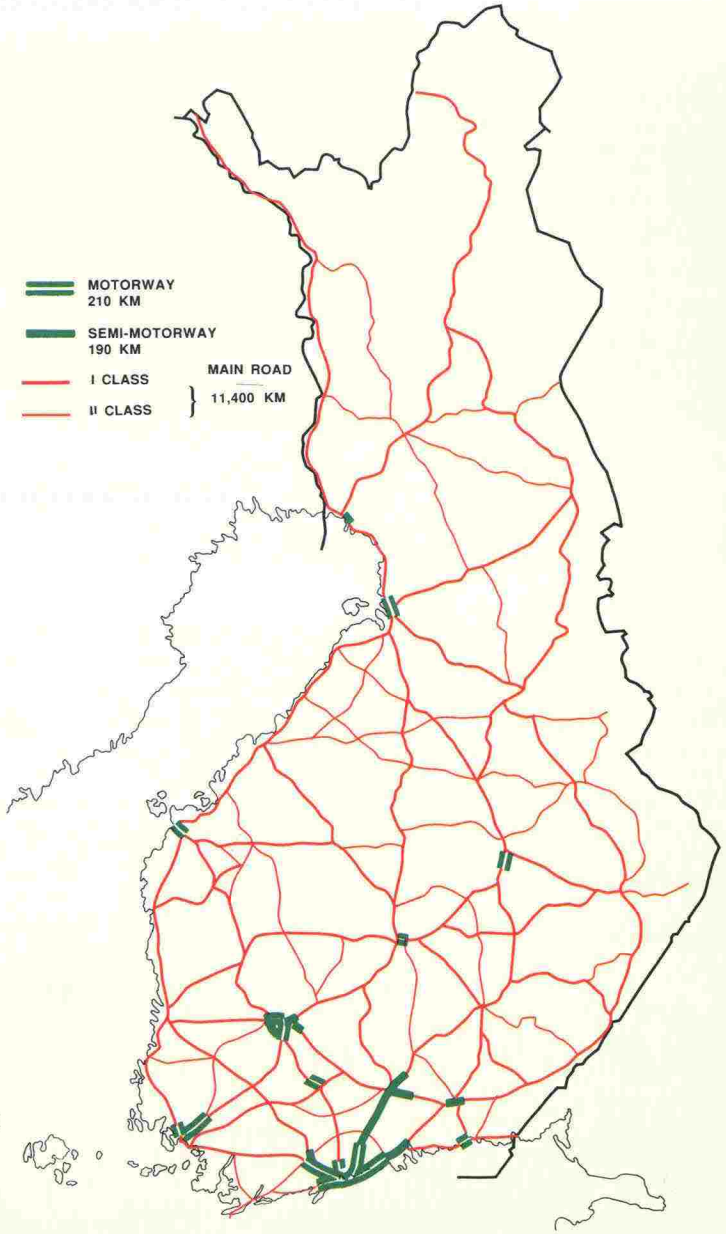
The Regional Planning Authorities have in the regional plans of 1988 and their initiatives emphasized how necessary it is to develop the most important main roads of the regions.

Starting points for planning

On 1 January 1989 there were about 76 200 kilometres of public roads, of which about 11 400 km (i.e. 15 %) were main roads (I class or II class roads). Motorways and semi-motorways (one carriageway) account for about 400 kilometres of the main roads.

In 1988 56 % of the entire road traffic was on the main roads. The same year 48 % of the accidents (fatalities or injuries) on public roads occurred on the main roads.

The number of kilometres driven on main roads in 2010 is projected to be about 61 % of the number of the entire public road network.



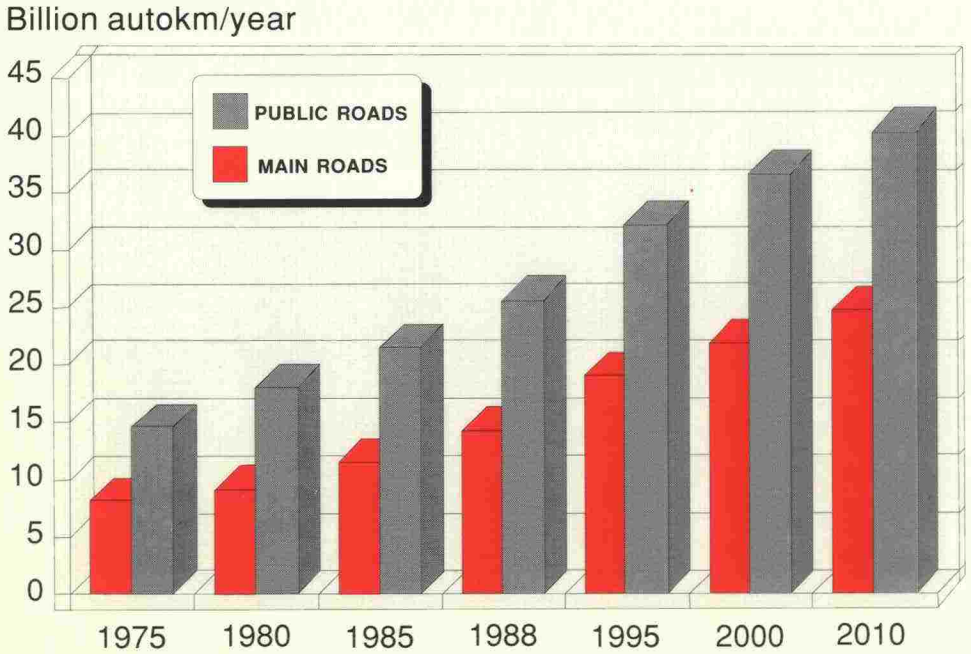
Main roads in 1989

There will be congestion on main roads

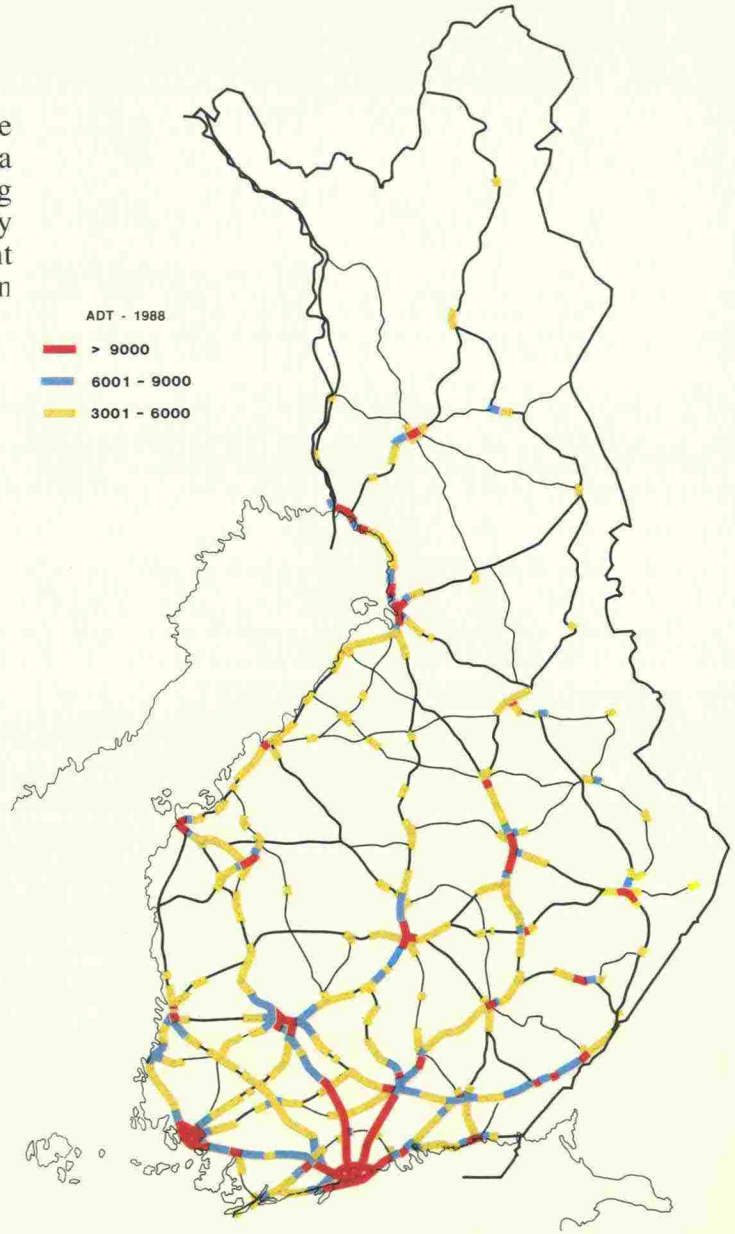
During the years 1980-88 the traffic on main roads has grown 56 %, which means on an average of 5.7 % a year. The growth was the fastest in the southernmost part, where it was 69 % - an average annual growth of about 6.8 %.

The gross domestic product has on an average grown 2.9 % a year during the corresponding period.

It has been projected that traffic will increase by about 54 %, i.e. on an average of 3.7 % a year, from 1988 to the year 2000. According to the projection traffic will grow 74 % by 2010. On the roads from large cities the amount of traffic will probably grow even faster than this.



Growth in the number of kilometres driven



Amount of traffic in 1988

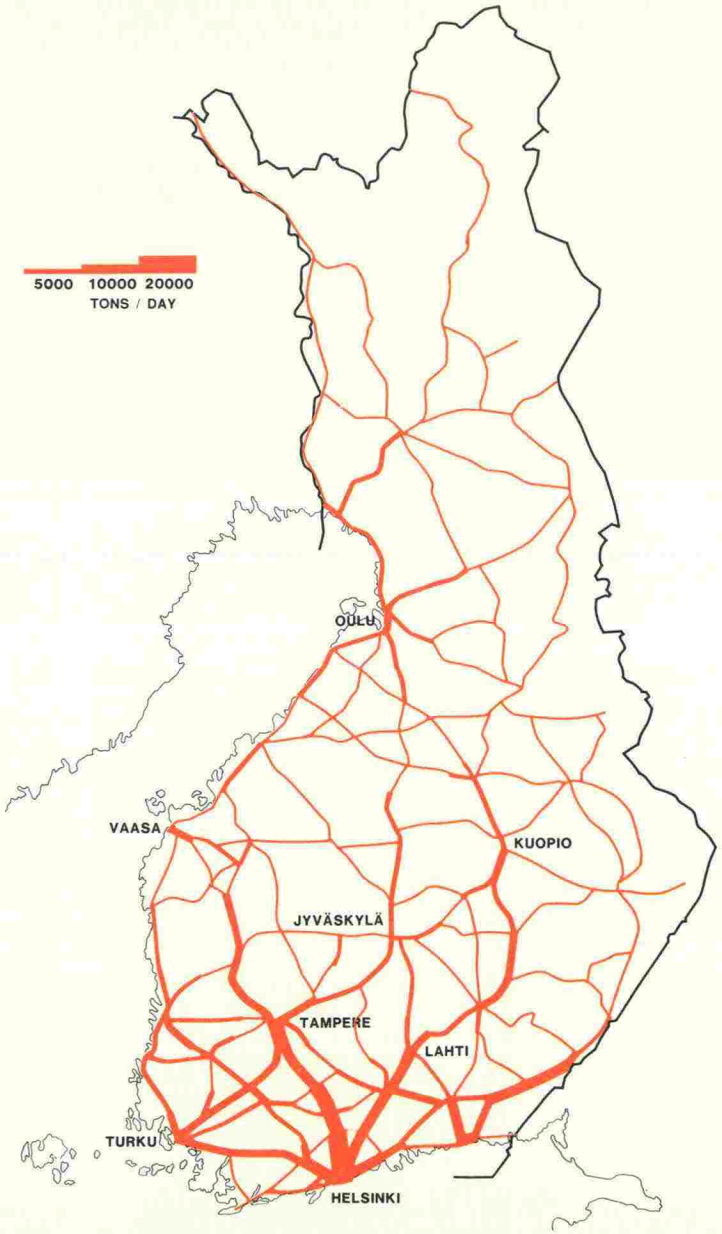
Trips will take longer

The traffic conditions on I class main roads with the most traffic has been deteriorating rapidly during the last few years. Already nowadays there are queues and traffic jams on many I class main roads connecting provincial centres.

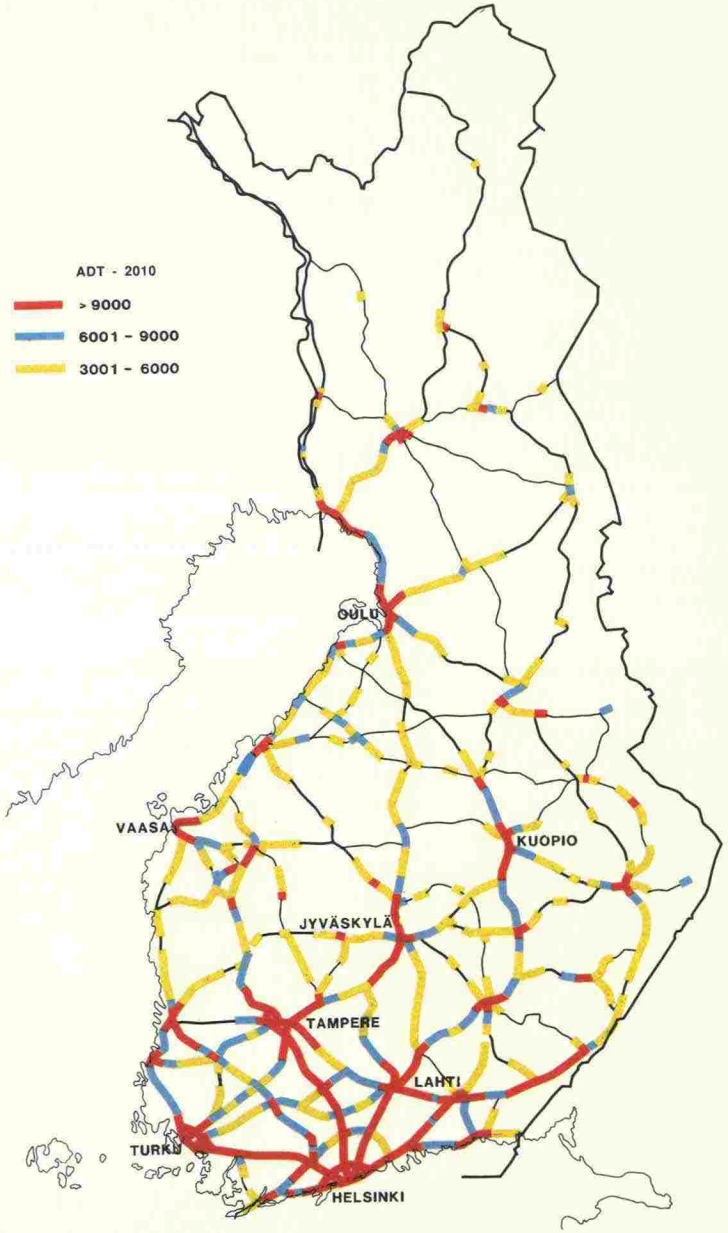
Most of the jams and queues are due to week-end traffic and commuting. In 1988 there was weekend traffic congestion on 720 kilometres and long queues on 1840 kilometres of the main roads. During this decade the amount of main roads with traffic congestion and queues has more than trebled.

In the future the traffic conditions on main roads will deteriorate so much that according to a projection for 2010 a major part of the I class main roads with the liveliest traffic will be congested and there will be queues unless the capacity of the roads is not raised. The situation is even worse since transportation and long-distance traffic are concentrated on the same roads.

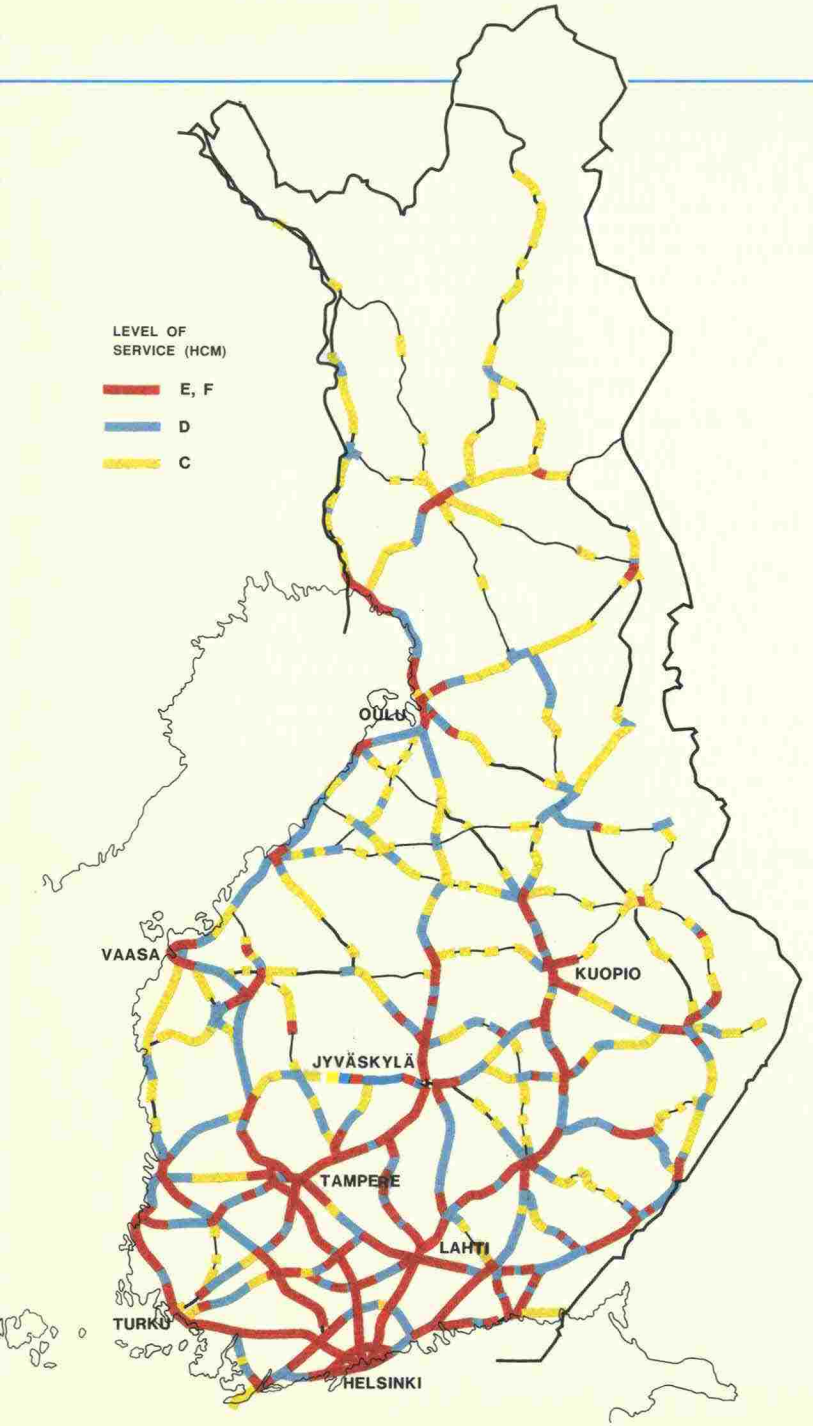
/1/ Statistics on goods transport by road, Helsinki 1985, Roads and Waterways Administration 713205



Goods traffic on main roads in 1985 /1/



Amount of traffic in 2010



Level of service in 2010 on the present main road network without improvement measures

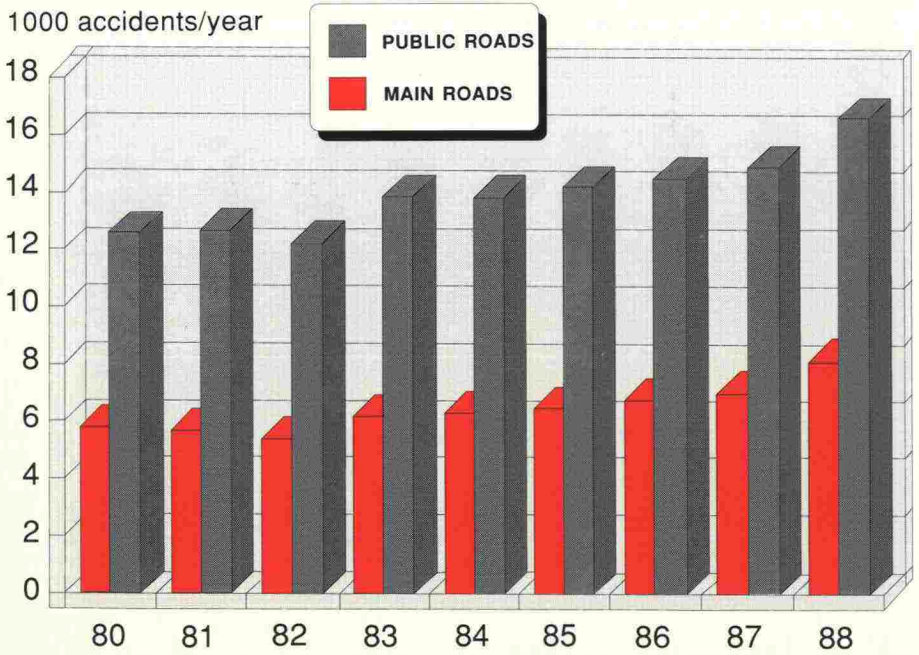
What are traffic conditions like in different levels of service?

A • Driving is almost free and easy	
B • Driving conditions good • Overtaking easy	
C • Traffic is fairly easy but disturbances are possible • Queues begin to form and overtaking becomes difficult	
D • Traffic queues and disturbances • Overtaking very difficult (dangerous overtaking) • Sudden braking (danger of collision)	
E • Congested traffic, continuous queues • Overtaking almost impossible (and useless) • Driving is exhausting: constant change of speed, danger of pile-ups • Very difficult to get on the main road	
F • Blocked roads • Cars crawl and keep stopping	

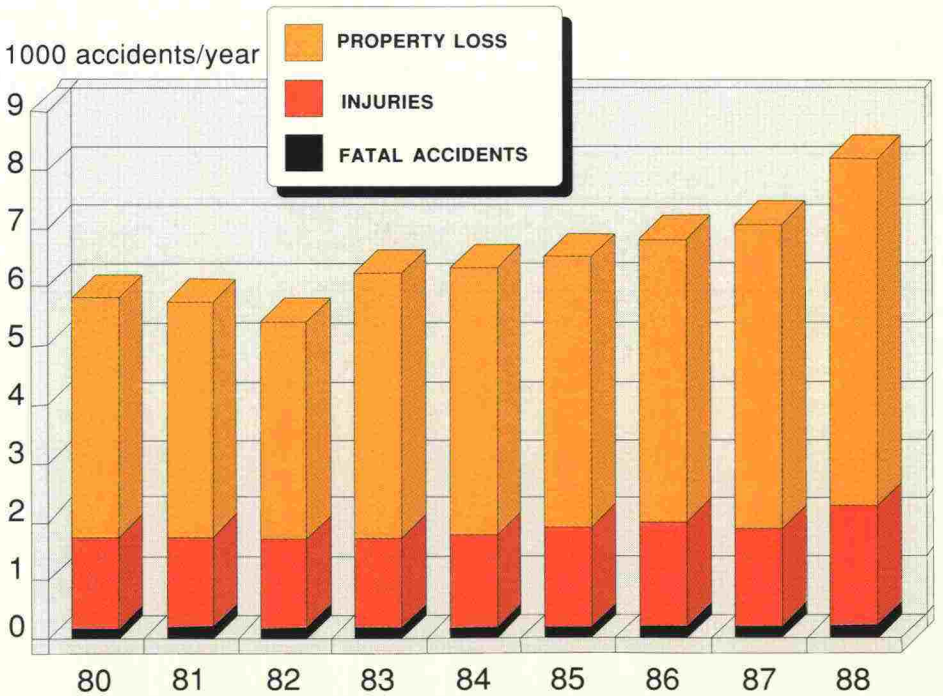
Insecurity is increasing

Accidents involving people (fatal accidents or injuries) have increased 31 % on the main roads from 1980 to 1988. The increase of fatal accidents has been 42 % while the corresponding figure for all accidents has been 41 %. The number of traffic accidents has been growing from 1983, the increase being highest from 1987 to 1988.

In 1988 there were about 8200 traffic accidents on the main roads. 268 people died and about 3300 people were injured.



Development of the number of accidents



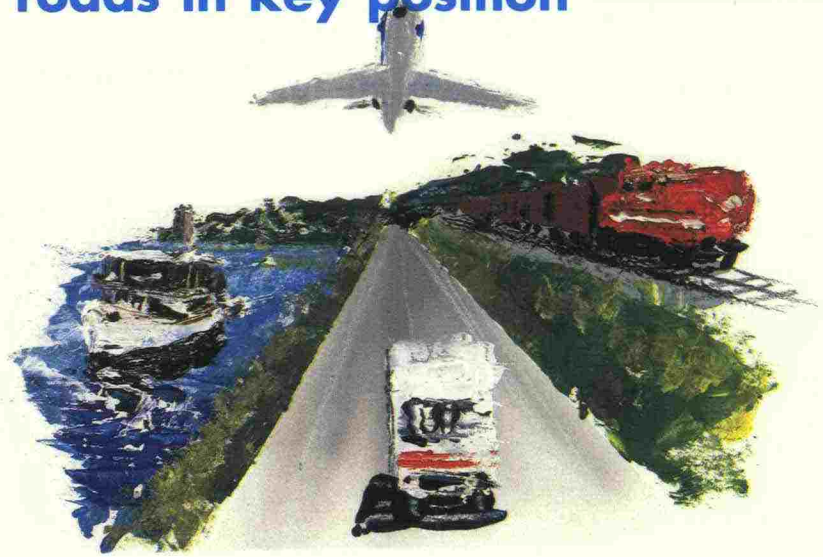
Accidents on main roads

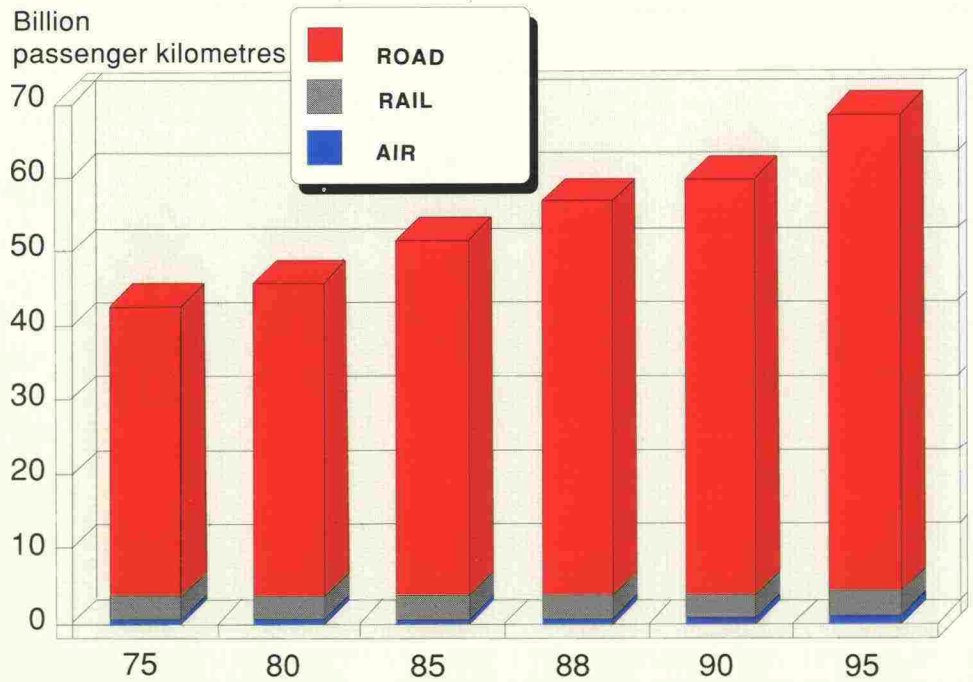
The share of road traffic will increase – main roads in key position

Road traffic

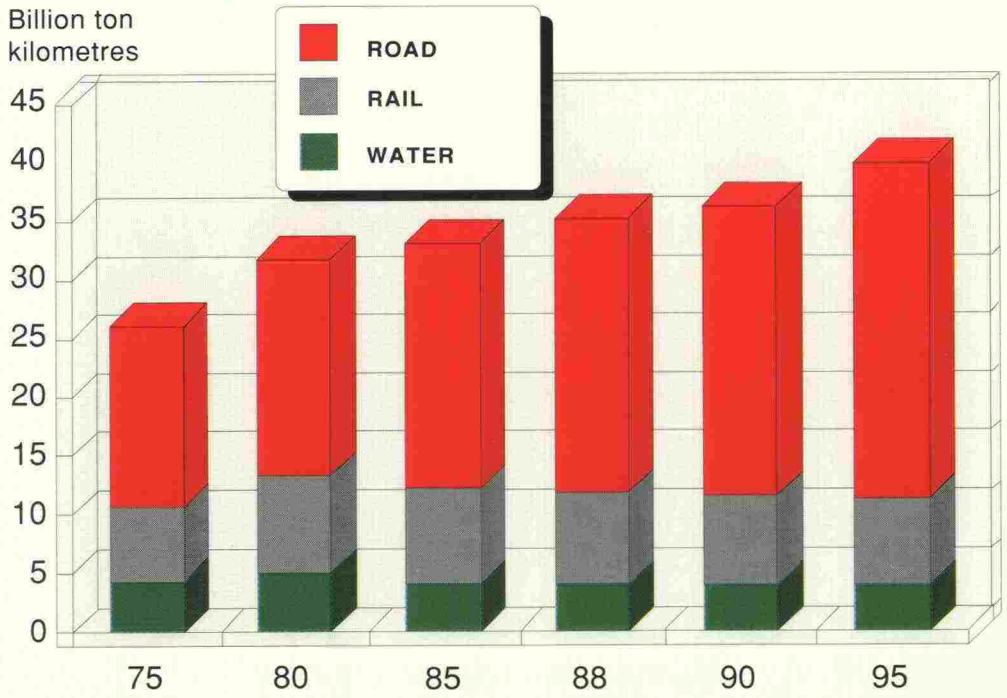
In 1988 the share of road traffic in the passenger traffic of Finland was 93 % measured in passenger kilometres and in goods traffic the figure was 66 % measured in ton kilometres. According to the projections made, the growth of road traffic will continue both in passenger and goods traffic /2/. A major part of the growth will be on the main roads.

/2/ The plan of the Ministry of Transport and Communications for 1990-94. Helsinki 1988, Ministry of Transport and Communications





Development in passenger traffic



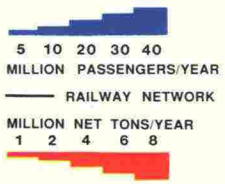
Development in goods traffic

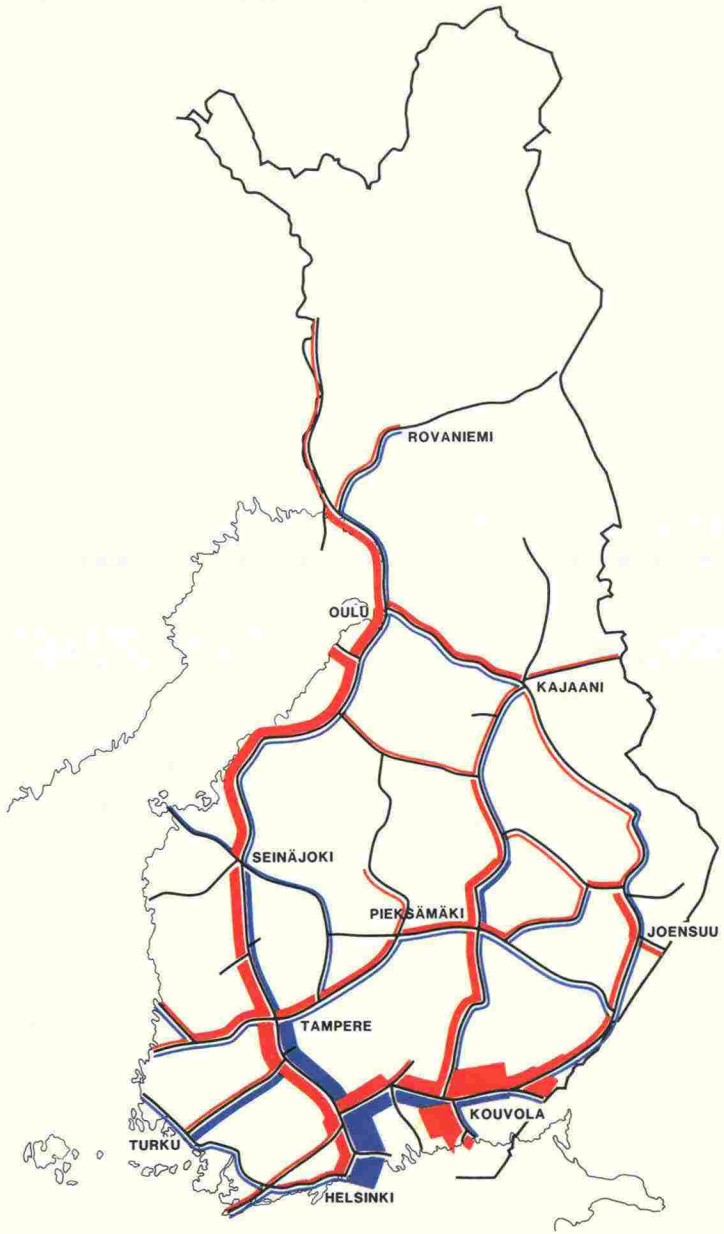
Rail traffic

In the passenger traffic of Finland in 1988 the share of rail traffic was 6 % measured in passenger kilometres and in goods traffic the figure was 22 % measured in ton kilometres.

According to projections rail passenger traffic will grow 1 % annually and goods traffic will decrease by 0.6 % annually in the next few years /2/.

In passenger traffic the emphasis will be on traffic between large centres of population. The main areas will be Helsinki and Tampere as well as Helsinki and Turku. The development of rail traffic, especially as far as passenger traffic is concerned, crucially depends on how the Finnish State Railways will be able to increase the speed of trains and improve the service level.





Passenger and goods traffic by rail in 1987

Water traffic

The share of water traffic in 1988 in domestic goods traffic was 12 % measured in ton kilometres. The corresponding figure for passenger traffic was insignificant.

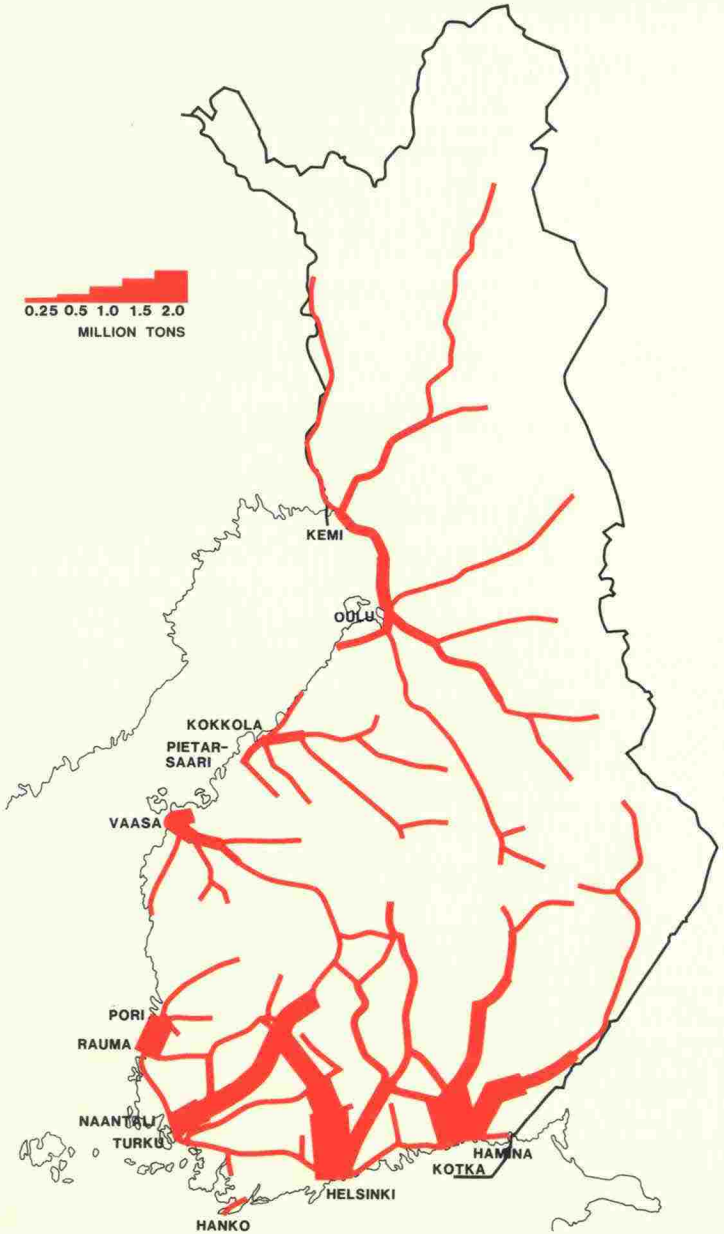
The liveliest export ports were Hamina, Kotka, Sköldvik, Helsinki and Rauma. For imports the major ports were Sköldvik, Helsinki, Naantali, Raahe (Rautaruukki) and Pori.

According to projections the role of water traffic will remain constant in domestic goods traffic in the next few years /2/. In the future general cargo will be concentrated in the ports of Kotka, Hamina, Helsinki, Hanko, Turku, Naantali, Rauma, Pori, Vaasa, Kokkola, Pietarsaari, Oulu and Kemi. The exports and imports of these ports are projected to grow 3 % annually in the next few years /3/.

There are two new transport routes being planned i.e. Scanlink and Baltlink. Scanlink emphasizes the importance of rail transport with road transport to the ports in Western Finland. Baltlink focuses on road transport to the ports in Southern Finland.

/2/ The plan of the Ministry of Transport and Communications for 1990-94. Helsinki 1988, Ministry of Transport and Communications

/3/ Development program of ports, Helsinki 1988, Committee report 1988:47



Road transport to and from ports in 2000

Air traffic

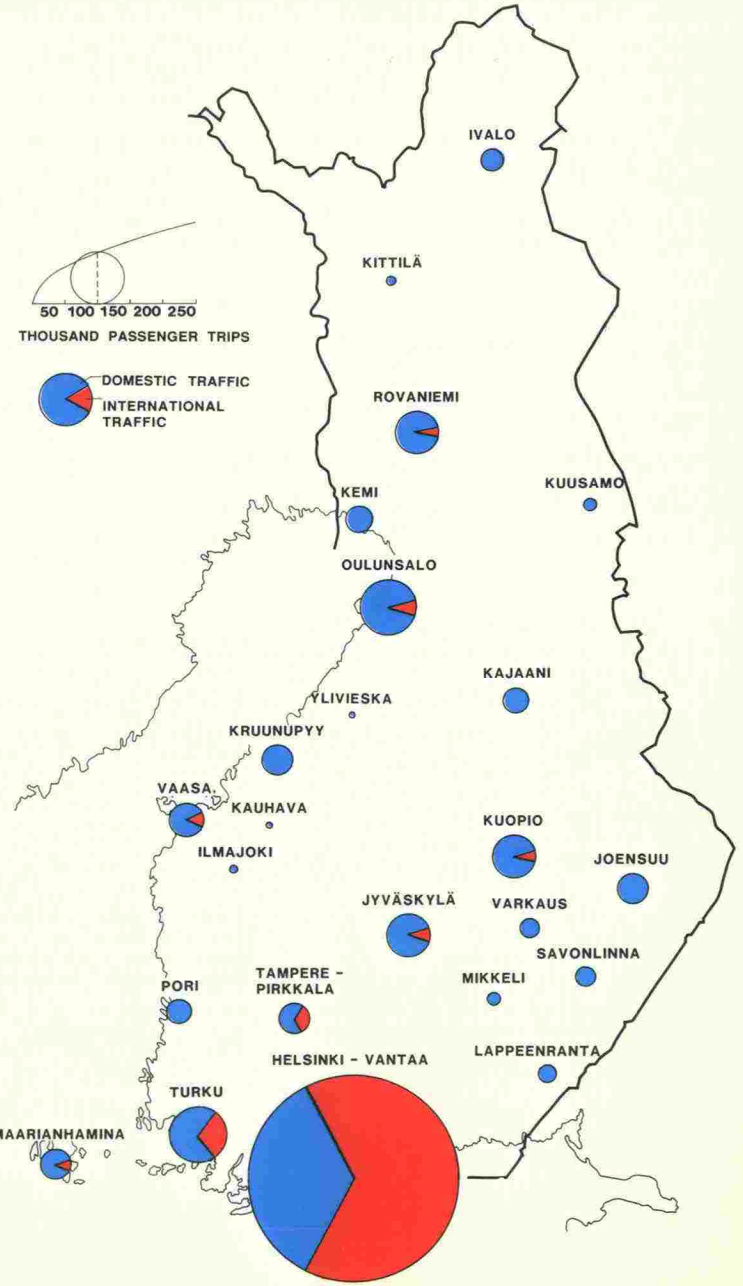
In passenger traffic the share of domestic air traffic was 1 % measured in passenger kilometres in 1988. Transportation of goods by air is very modest. Helsinki-Vantaa airport is by far the liveliest airport in Finland, with Oulu, Turku, Jyväskylä, Kuopio and Rovaniemi following it.

The number of passengers on domestic flights is projected to grow on an average of 6 % annually with the corresponding figure being as high as 10 % in international traffic /2/. At present international air traffic is almost totally concentrated in Helsinki-Vantaa, but in the future other airports (Oulu, Tampere, Turku) will also be used.

Data traffic

In the field of telecommunications the number of telephones has increased by 7-10 % and in mobile phones and data networks the annual growth has been as high as 30-40 % in the 1980´s. In Finland telecommunications are highly developed.

In data traffic it is projected that targeted communication will grow approximately 7 % annually /2/. Even though electronic communication is growing and facilitating contacts, this will not replace physical traffic.



Airport passenger traffic in 1988

Development needs of main roads

Reliability and improving the level of service have been and still are the main aims in developing traffic systems. The increase in domestic and international contacts make the service level and reliability even more important. The remote location of Finland and the long distances are also factors adding to their significance.

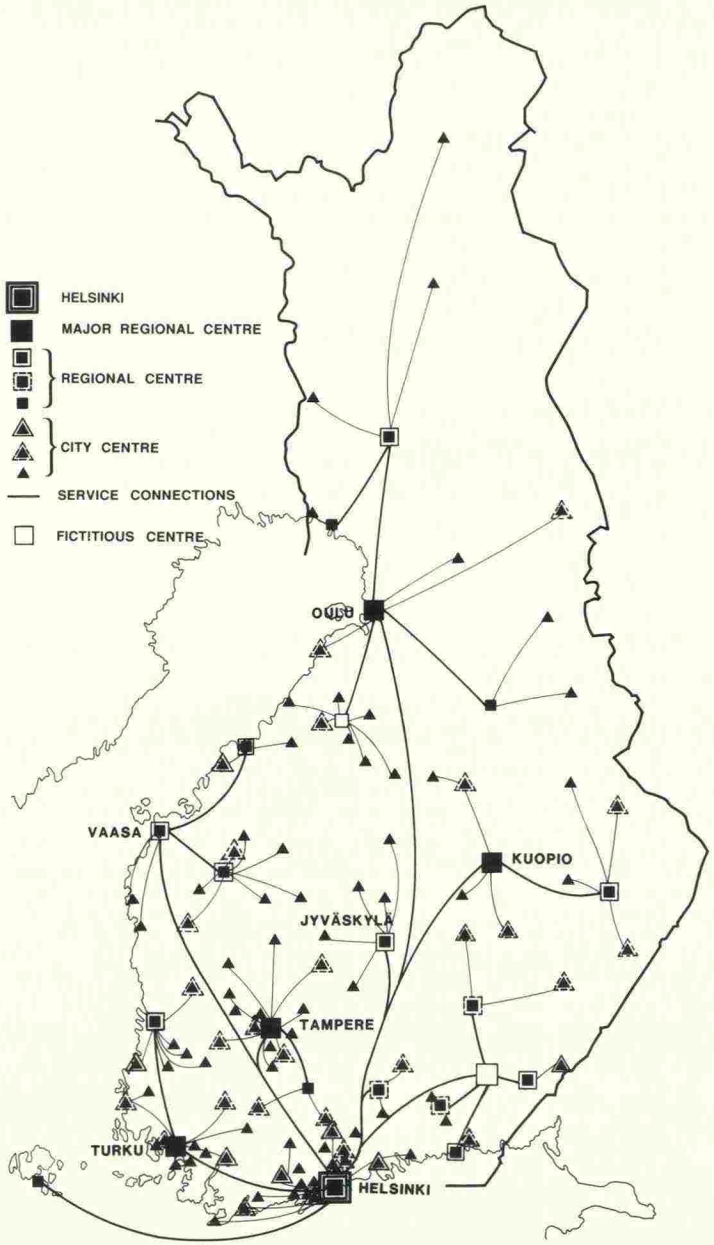
In road traffic a high standard main road network is the condition for improving the traffic system. This also reinforces the social and economic development in Finland.

Regional reasons

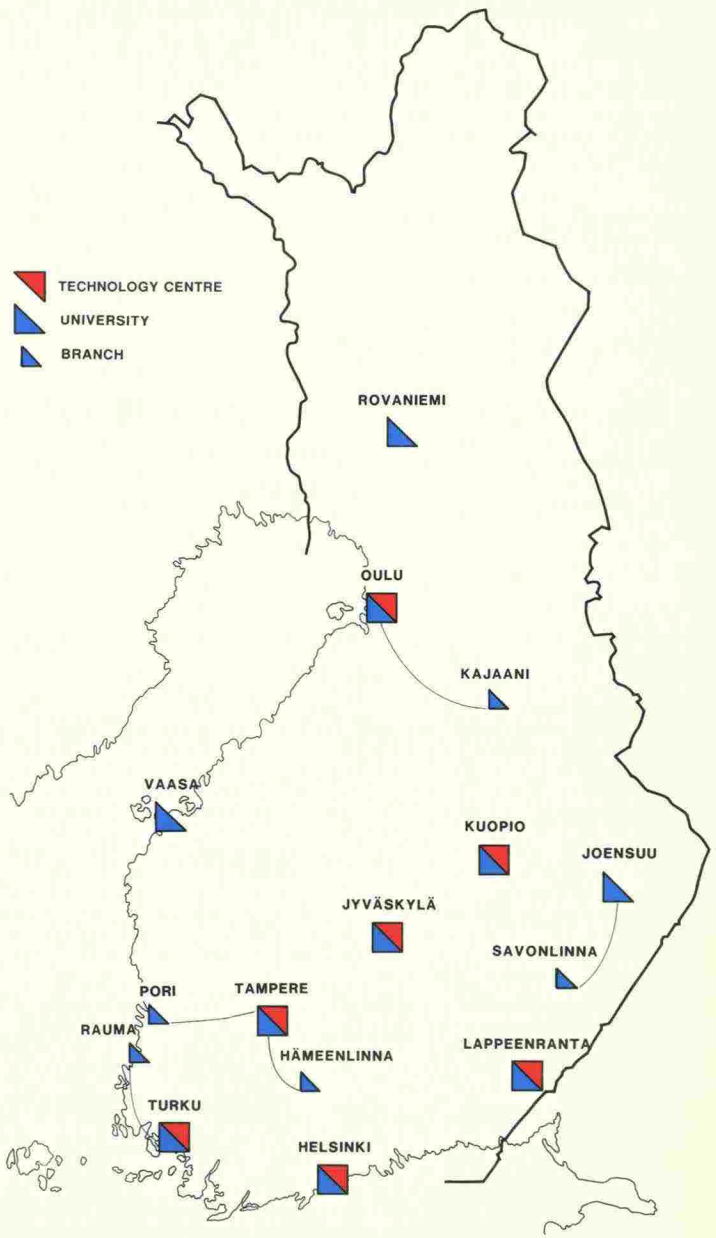
In the balanced development of the different parts of Finland it will be increasingly important to remember the need for contacts between the Helsinki area and regional centres, as well as contacts between the various regional centres. This will mean

- increasing the capacity, reliability, speed and service level of contacts between the Helsinki area and other centres
- improving cooperation between the various instances involved in training and research
- promoting high technology, highly developed production methods and services connected to them in all parts of the country
- improving the training, research and production skills in various parts of the country
- improving the possibilities for direct international contacts in areas outside the capital city
- eliminating barriers that hinder development in the various population centres /4/

High standard main roads are one of the most important factors in developing the various parts of Finland.



Service centre network in 2010 according to reports by the Regional Planning Authorities



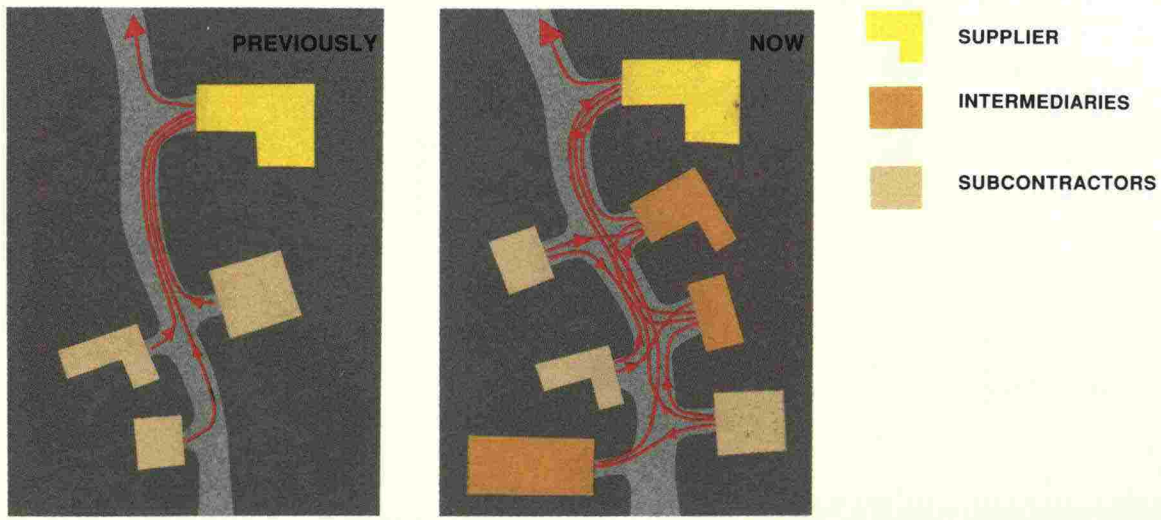
Concentration of knowledge and expertise in 1989

/4/ Structural change and balanced regional development, Helsinki 1989, Ministry of the Interior

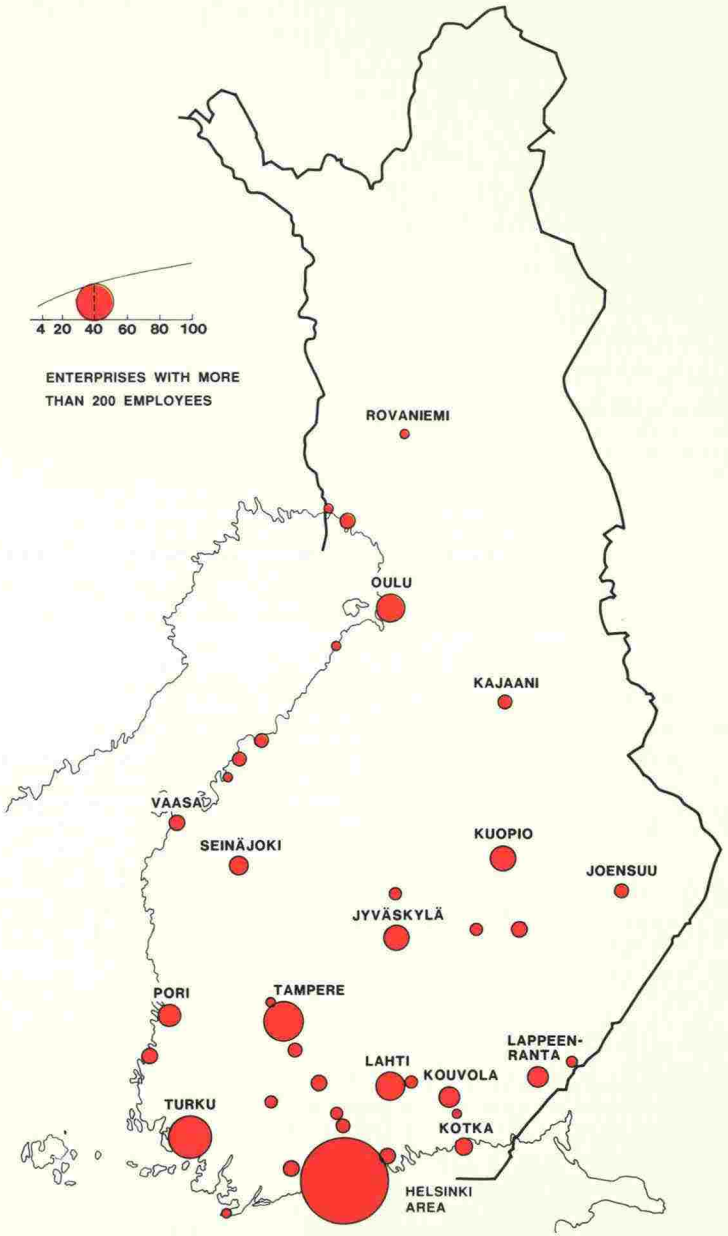
Transportation and social economic reasons

Transportation costs and the service level of transport have a more dominant role in Finland than in Western Europe in general. This is due to the location of our country and the structure of industry. The share of transport costs is about 10 % of the total price in domestic goods and about 15 % in export goods. With Just-On-Time production techniques and the increase in the subcontracting industry the speed, reliability and flexibility of deliveries have become increasingly important.

Reducing transport costs and improving service are important means in improving the productivity and profitability of industry. High standard main roads are a necessity for transport. They reduce transport costs, improve service and make it possible for industry and business, especially those engaged in foreign trade, to be located in different parts of the country.

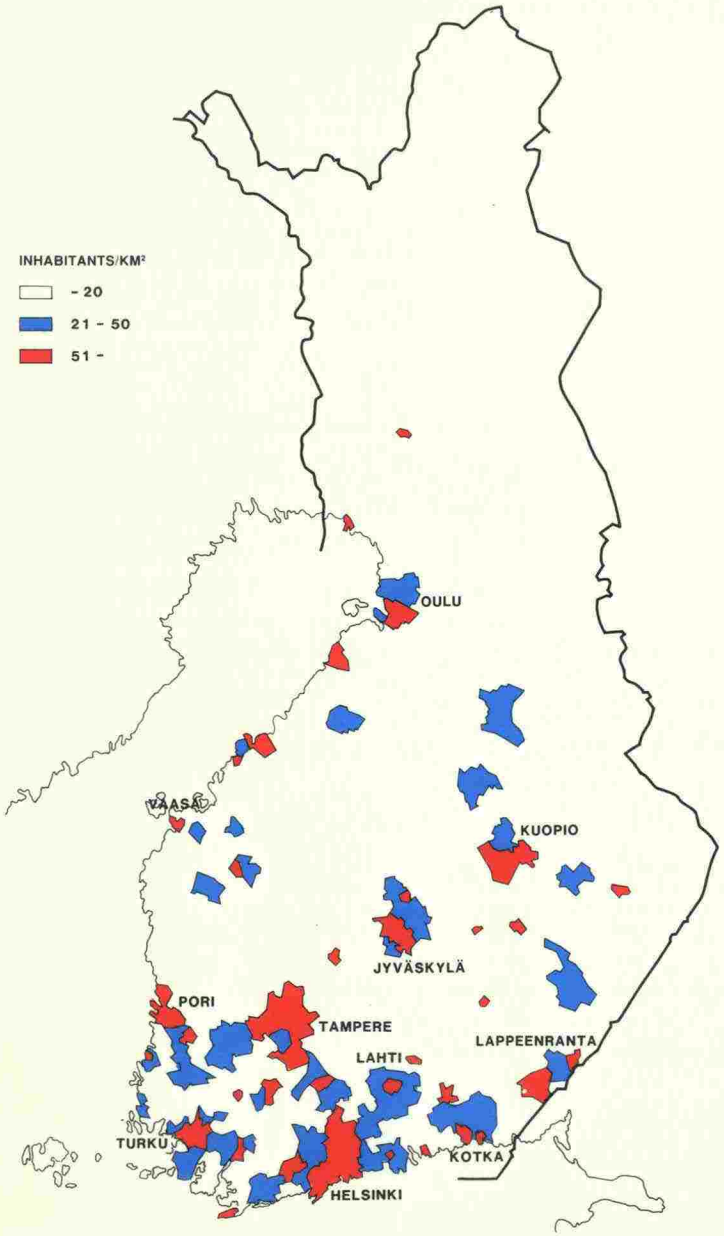


Deliveries in the subcontracting industry are increasing



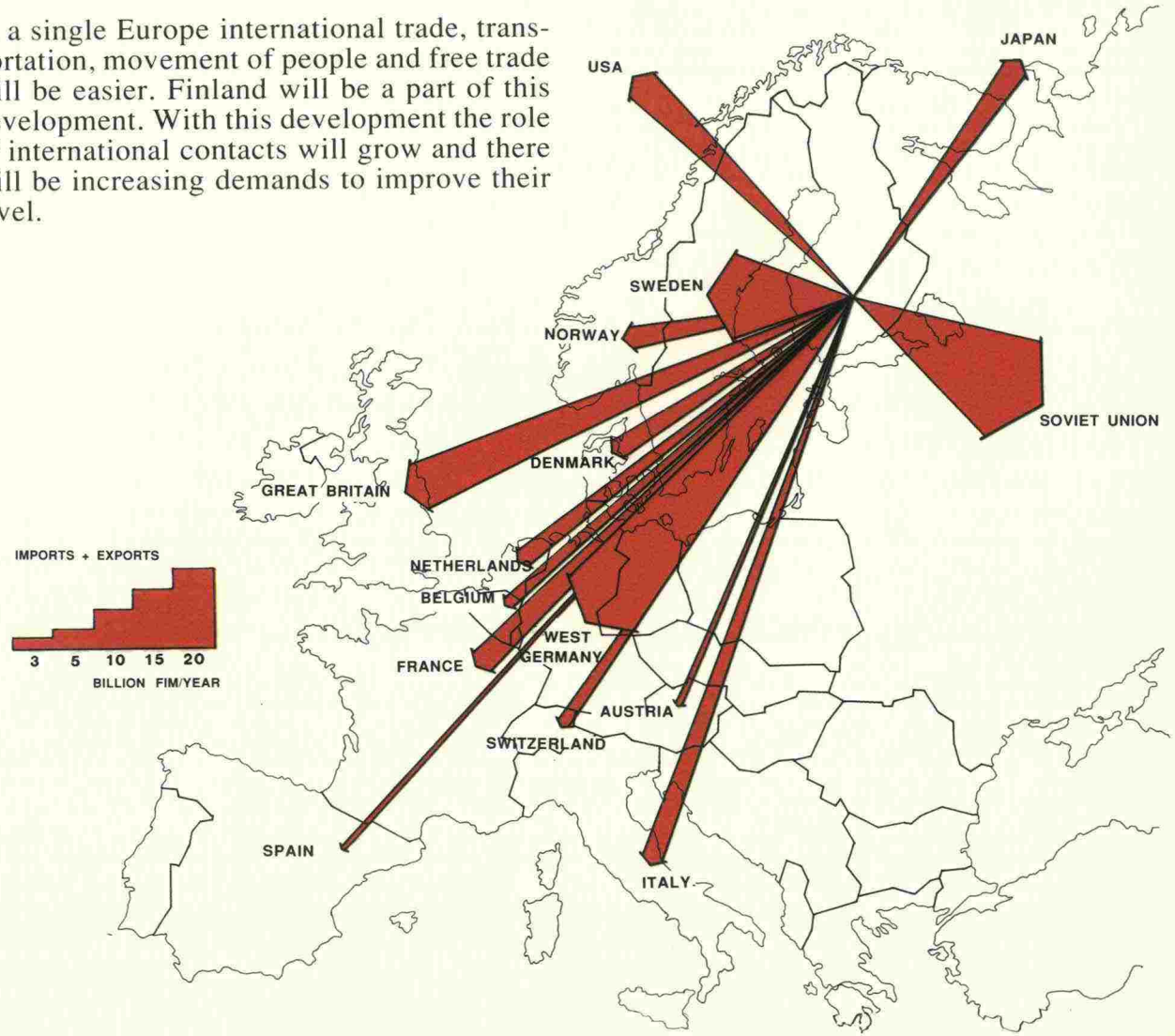
Concentration of business in 1988

Internationalisation



Population density in 1985

In a single Europe international trade, transportation, movement of people and free trade will be easier. Finland will be a part of this development. With this development the role of international contacts will grow and there will be increasing demands to improve their level.



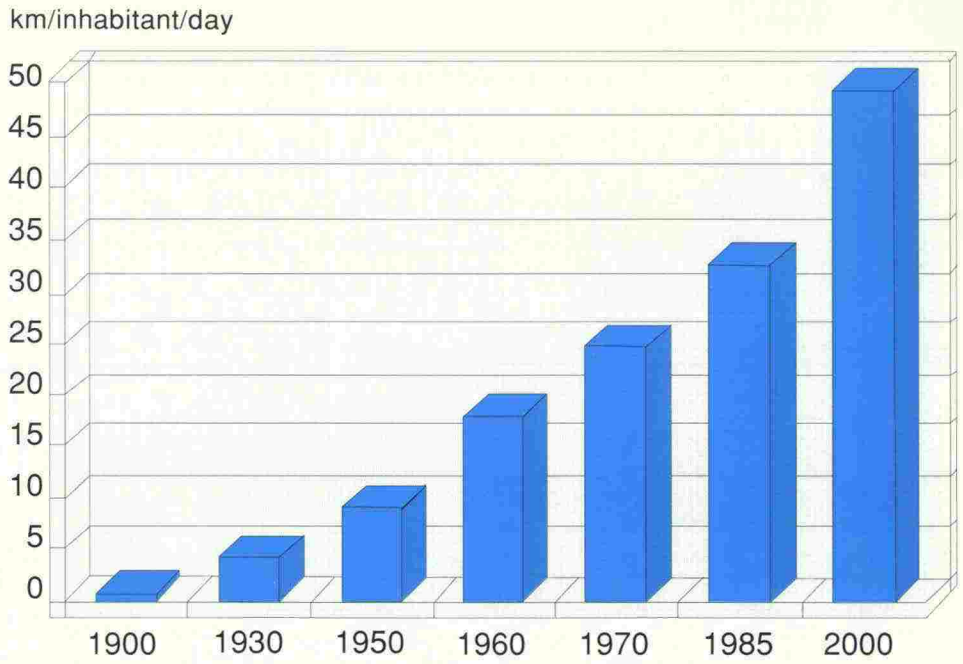
The most important trading partners in 1986

Growth in mobility

In 1986 Finns moved a good 40 kilometres a day using 70 minutes for this. In ten years the average distance has grown by about 6 kilometres, while the time used has remained more or less constant. The largest growth in mobility has been in automobile traffic.

It has been estimated that in the year 2000 people will move about 50 kilometres a day, whereas there will be no significant growth in the time used. The largest growth is still estimated to be in automobile traffic.

The growth in mobility has been caused by the development of traffic vehicles, the dispersion of dwelling- and job districts, the increase in leisure and the number of holiday resorts. In future these factors will increase mobility the most.



Growth in mobility /5/

/5/ Future Society (K-Samhällets Framtid), Andersson Å & Strömquist U, Stockholm 1988

Future needs

The regional and economic development of Finland, internationalisation and the growth in mobility require an essential improvement in the most important links of the main road network. In future there will be a growing demand for this. The regional and social changes of future development should be taken into consideration in defining to what extent the main road network should be developed.

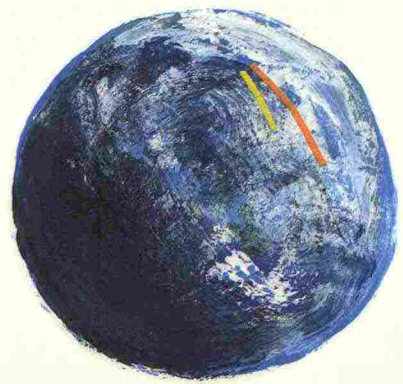
A high standard main road network is the outcome of several stages in a longer period of time. Land use planning and other planning make this possible at a local and regional level.

The extent of the main road network

The main road network is 11 400 kilometres long. From the traffic point of view it is very unhomogenous.

The improvement costs of the main road network are high. It is important to define the extent of the main road network, its level of service and development programme in order to be able to use the limited resources as efficiently as possible.

As a starting point for discussion there are two alternatives whose economic, traffic, environmental and social effects have been assessed at the end of the study.



Principles for defining the main road network

The principles for defining the main road network are the following:

1. **Supporting regional structure**

   The main road network connects the centres of the different parts of the country to the Helsinki area and supports their development aims.

2. **Supporting the economy**

   The main road network connects population and job concentrations and enables the development of the important industries and business in different regions.

   The main road network makes the movement of goods and people faster, reduces transportation- and movement costs, improves economic competitiveness in addition to raising social economic efficiency.

3. **Connections to the most important ports and international air terminals**

   The main road network makes good connections possible to the most important ports and international air terminals.

4. **International connections**

   The main road network connects Finland to the international roads in Sweden, Norway and the Soviet Union and through them to the rest of Europe.

5. **Check on environmental problems**

   Environmental problems are controlled better by concentrating traffic on the main roads

6. **Traffic safety**

   Moving on the main roads is safe.

7. **Main road network unity**

   The main road network is a united entity.

Motorway and semi-motorway links in the main road network

Here are the reasons for the proposed change of a main road link into a motorway or semi-motorway in the different alternatives:

motorway

- because of great traffic amounts
- for network reasons - if the semi-motorway between two motorways is very short

semi-motorway

- as an extension of a motorway on the basis of traffic amounts. In this case a semi-motorway can be the first construction stage of the motorway
- when the main road has to be built in a new place due to land use, poor geometry or network reasons and the new road fits into the rest of the motorway/semi-motorway network

Development alternative A focusing on regional structure

4700 kilometres

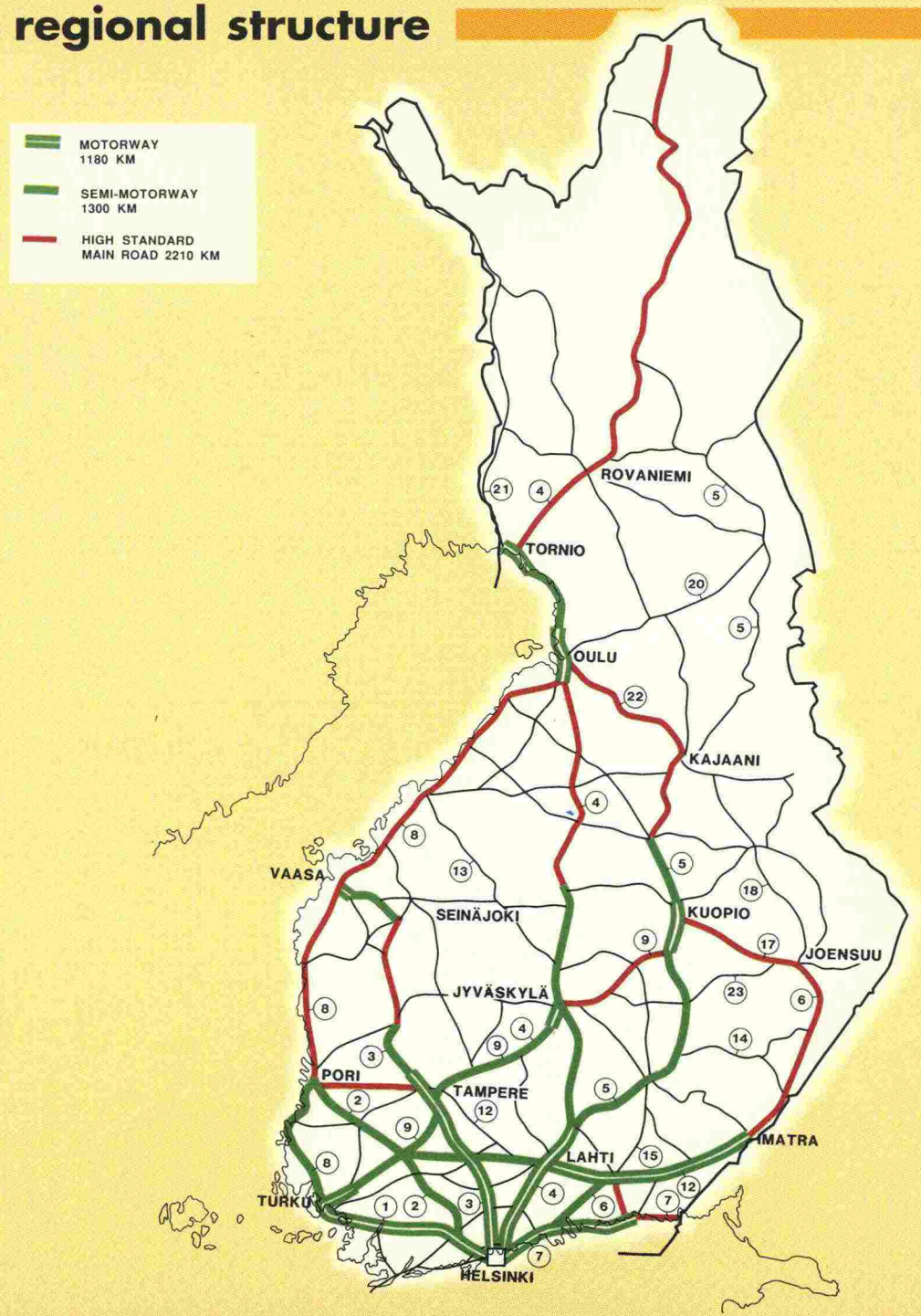
Length: about 4700 kilometres i.e. 41 % of the length of the present main road network and 6.2 % of the entire public road network

Kilometres driven in 2010:

58 % of the kilometres driven on the present main road network and 33 % of the kilometres driven on the entire public road network

The main road network according to alternative A

- connects the major regional centres to the Helsinki area and connects regional centres to their major regional centre
- offers good connections to ports and the frontier
- is a united network
- covers the whole of Finland quite well.



Development alternative B focusing on traffic

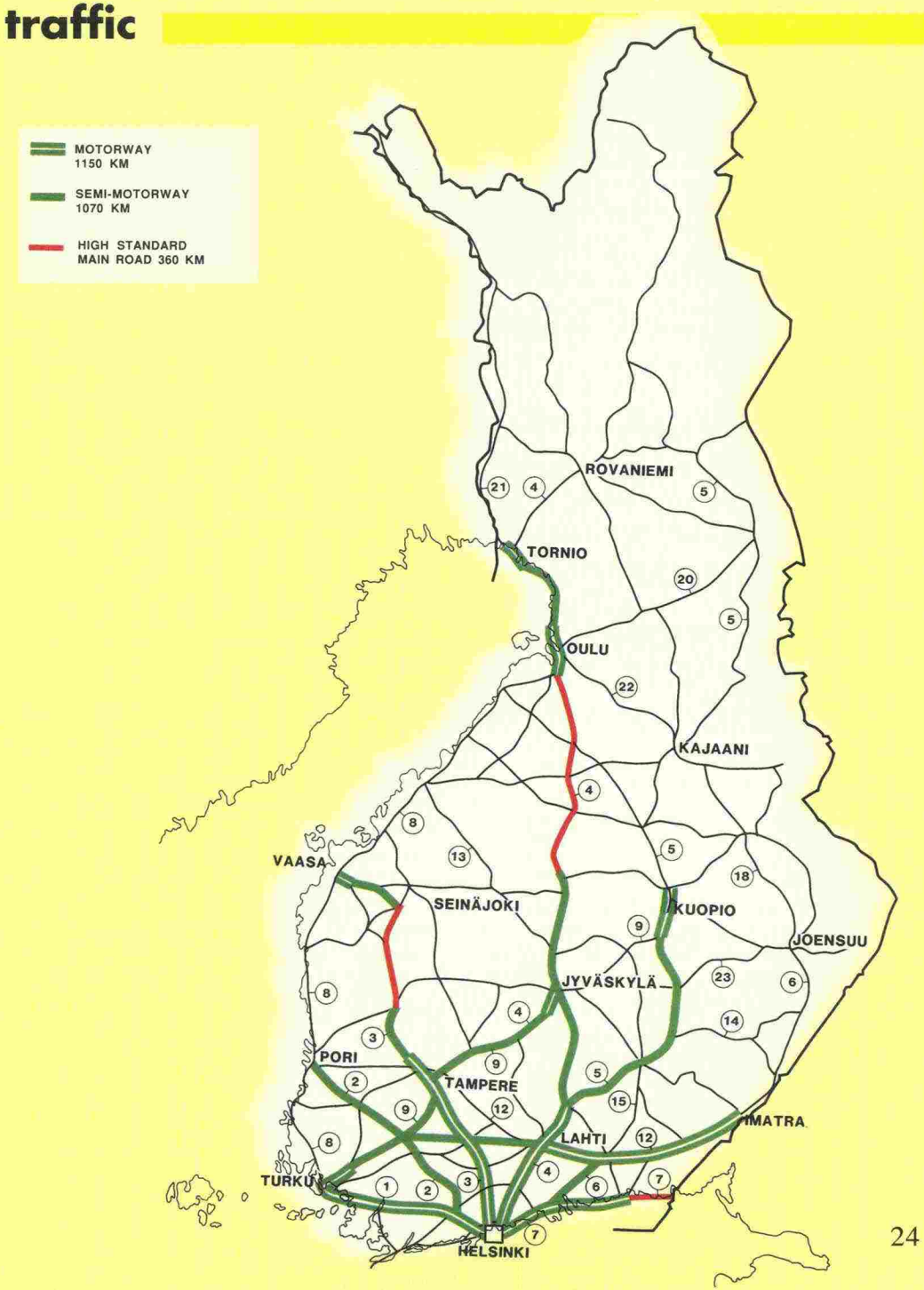
2600 kilometres

Length: about 2600 kilometres i.e. 23 % of the length of the present main road network and 3.4 % of the entire public road network

Kilometres driven in 2010:
37 % of the kilometres driven on the present main road network and 21 % of the ones driven on the public road network.

The main road network according to alternative B

- connects the major regional centres to the Helsinki area
- serves Southern and Central Finland primarily



Quality of main roads

High standard main roads

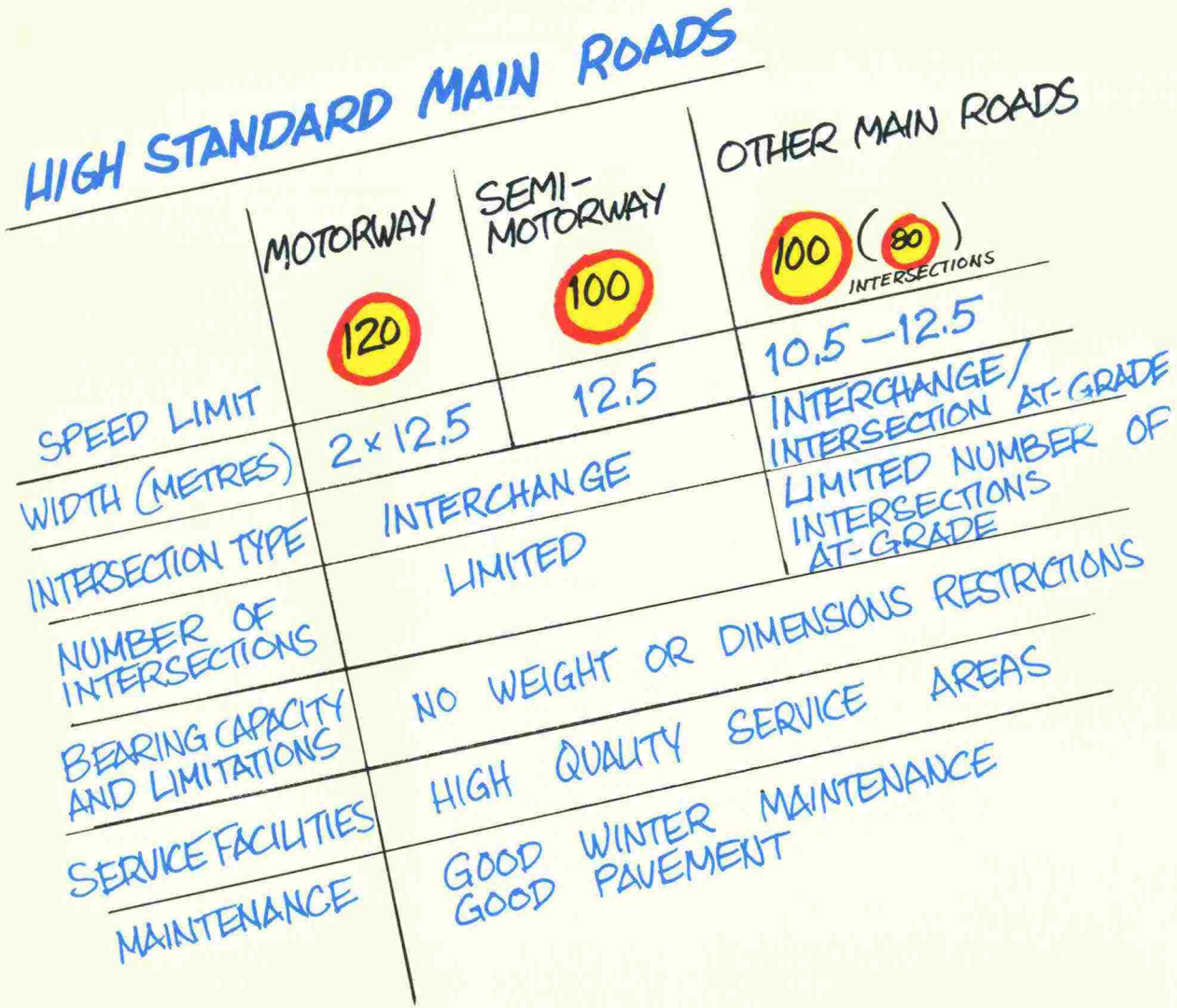
High standard main roads will be built or improved into higher quality roads than other main roads in similar conditions. A higher quality will improve transportation, reduce travel times, ensure an even travel speed and decrease traffic costs. An equal standard in quality means that there is a constant almost stable standard as to the width of the road, the geometric features, speed limits, service level and maintenance.

High standard main roads are motorways, semi-motorways or main roads where also other than automobile traffic is permitted. The essential characteristics of main roads can be described in the following way:

Motorway

Semi-motorway

Other main road



Other public roads

Public roads and main roads not belonging to the high standard main road network will not be forgotten. They will be developed according to the road class and the needs of traffic and environment.

The measures on these roads will primarily be improvement in the condition of the paved roads, promotion of traffic safety, and intensifying winter maintenance.

In densely populated areas the measures will first and foremost be focused on improving traffic safety and the traffic environment. On roads with large amounts of traffic, efforts will be made to raise the capacity.

Costs and timing of developing the main road network

Estimation basis

The following unit costs have been used in the estimation of construction and improvement costs of rural high standard main roads:

- motorway FIM 20 million/kilometre
- semi-motorway FIM 12 million/kilometre
- other main road FIM 5 million/kilometre

In urban areas the costs have been estimated individually in each project. The costs have been estimated according to the 1989 price level (road construction index 119). With motorways and semi-motorways the entire traffic environment is rebuilt on the terms of traffic and environment. This has an essential effect on unit costs. With other main roads it is a question of improvement.

The development of the main road network has been scheduled in three stages:

- 1 stage 1991 - 2000
- 2 stage 2001 - 2010
- 3 stage after 2010

The schedule estimates are based on the present road programmes, the ones being planned and the projected data on traffic volymes and levels of service of the main road network in the years 2000 and 2010. However, carrying out the work depends totally on government financing for the development of the main road network.

Price: FIM 33 - 47 billion

Lead time: 20 - 40 years

The costs of developing the main road network are the following:

Time of execution	Costs billion FIM	
	Alternative A	Alternative B
1 stage: 1991 - 2000	15	12
2 stage: 2001 - 2010	16	13
3 stage: after 2010	16	8
	47	33

The costs are not additional costs for developing these roads. A considerable amount of the money will be spent on building and improving the roads in any case.

For the sake of comparison it must be mentioned that about FIM 63 billion (1989 price level) has been invested in the present main road network in the last 30 years.

The effects of developing the main road network

Developing the main road network requires large investments. The aim of this study is to give a rough idea of the effect of these investments. The effects on traffic, road users, regional structure and partly also those on environment have been studied.

Growing need for investment – driving costs will decrease

The development costs of a high standard main road network are appr. FIM 47 billion in alternative A and appr. FIM 33 billion in alternative B.

With an improvement in the main roads, driving costs will decrease. In 2010 annual driving cost savings will be about FIM 1200 million in alternative A and in alternative B about FIM 1100 million compared to the present network. The share of heavy vehicles is about FIM 300 million/year in both alternatives.

It is mainly the motorways and semi-motorways belonging to the main road network that will bring the decrease in driving costs.

Improvement in the level of transportation service – decrease in transport costs

High standard main roads serve the present decentralized and highly automated production- and distribution system very well as it requires reliability and promptness.

With high standard roads the service level of deliveries will improve, transport costs will decrease and the competitiveness of industry will improve.

Improvement in traffic conditions

The development of high standard main roads will make higher and more even driving speeds possible. This will mean shorter travelling times between different areas. This is very important for the development of regional centres outside the Helsinki area.

In alternative A there will be a decrease from 1820 kilometres to 280 kilometres of congested and blocked main roads (service levels E and F) in weekend traffic in the year 2010, the figure for alternative B being 560 kilometres. In ordinary weekday traffic the corresponding decrease will be from 1150 kilometres to 130 kilometres in alternative A and 280 kilometres in alternative B.

Environmental effects

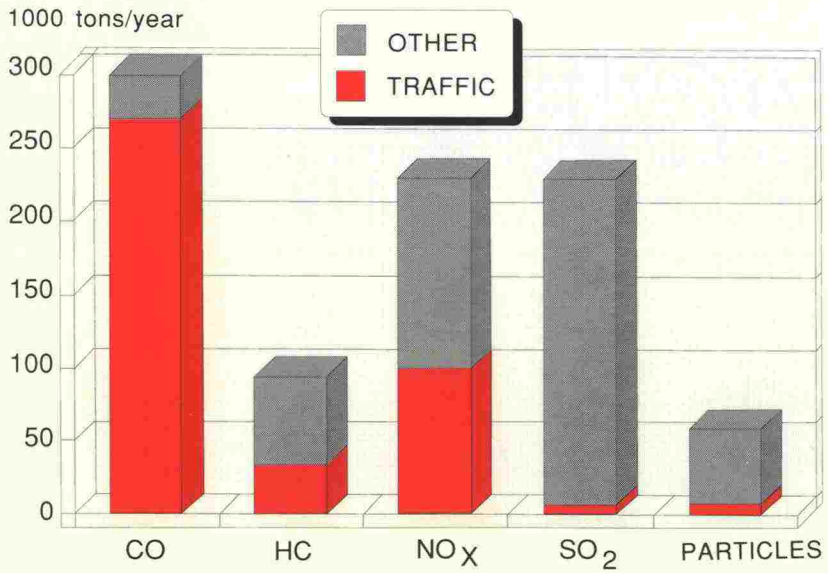
In this connection only traffic noise and air pollution can be dealt with. The other environmental effects are so specific that their assessment requires detailed road planning.

Vehicle noise mainly consists of motor noise, exhaust gas and noise from tires. In low speeds tires play an insignificant role, whereas in higher speeds, tire noise is predominant. Traffic noise can best be controlled with new motorways and semi-motorways, because it can be taken into account in the planning stage.

The development of the main road network will not significantly affect the quantity or quality of air pollution. Congested traffic with constant changes in speed causes more pollution than a smooth and even traffic flow.

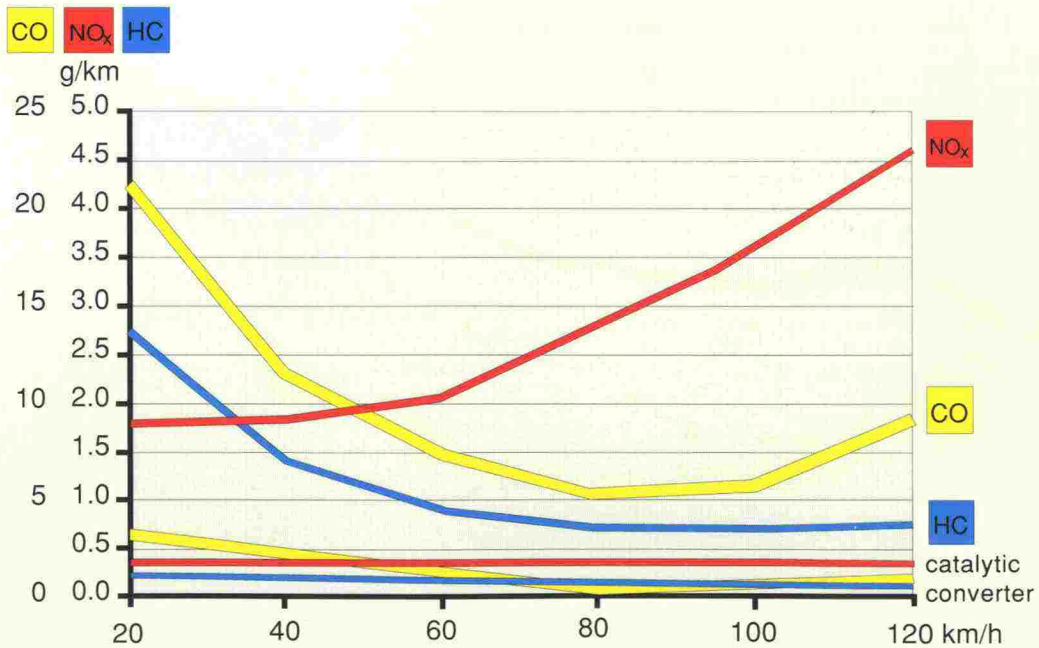
The situation in the amounts of road traffic emissions is changing. Due to the new exhaust gas norms of automobiles using petrol the emissions of nitrogen oxides (NO_x), hydrocarbon (HC) and carbon monoxides (CO) are decreasing considerably /6/. It is estimated that the total amount of emissions will be smaller in the early 2000´s than at present despite the growth in traffic and automobiles.

CO carbon monoxide
HC hydrocarbon
NO_x nitrogen oxides
SO_2 sulphur dioxide



The share of traffic in emissions

/6/ Possibilities of decreasing traffic nitrogen oxides, Helsinki 1989, Ministry of the Environment



Emissions of automobile traffic /6/

Regionally balanced development

The construction of high standard main roads between different regional centres and the Helsinki area will improve access to the Helsinki area, increase interaction between different regions and increase the possibilities of enterprises to be located in regional centres. All this will make the continuous and balanced development of different areas possible also in the future.

Improvement in traffic safety

Development of the main road network has a positive effect on traffic safety. On different roads the following injury/fatal accident rate (injuries and fatal accidents/100 million automobile kilometres) has been used in studies:

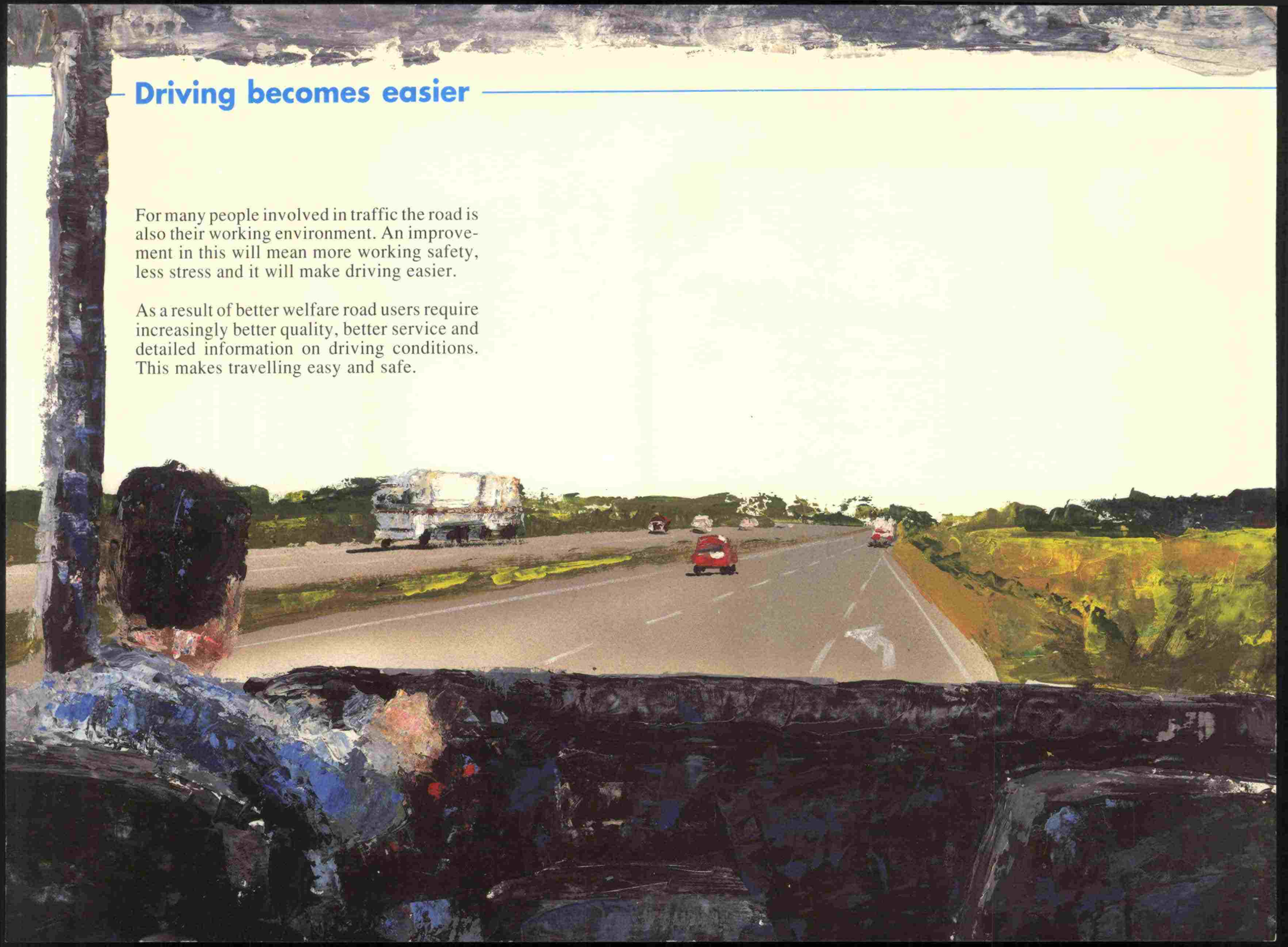
	Speed limit (km/h)		
	80	100	120
Motorway		9	11
Semi-motorway	9	11	
Main road	20	24	

Both alternatives reduce traffic accidents compared to the present network. The number of accidents leading to human injuries is 3 % smaller both in alternative A and B in the year 2010. This means about 55 injuries/fatal accidents less than in the present network. In accident costs it means appr. FIM 35 million a year.

Driving becomes easier

For many people involved in traffic the road is also their working environment. An improvement in this will mean more working safety, less stress and it will make driving easier.

As a result of better welfare road users require increasingly better quality, better service and detailed information on driving conditions. This makes travelling easy and safe.



Developing the main road network
Schedule 1989

May

Report of the Roads and Waterways Administration (RWA): Developing the main road network

June

Opening the discussion
RWA requests report statements from:

- central administrations
- central associations of land use planning
- central associations of industry and trade
- central municipal associations

September

Assessment of statements

October

RWA draws up a proposal for the long-term development of the main road network

December

RWA submits the proposal to the Ministry of Transport and Communications.

Further information
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